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Hawes

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[54] **UNIVERSAL PUMP COUPLING SYSTEM**

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[*] Notice: This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

[63] Continuation-in-part of application No. 08/207,357, Mar. 7, 1994, Pat. No. 5,529,462.

[51] **Int. Cl.**[6] **F04B 17/00**

[52] **U.S. Cl.** **417/360**; 417/361

[58] **Field of Search** 417/360, 361, 417/32

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,667,715	6/1972	Mertens	417/360 X
3,771,915	11/1973	Back	417/360
3,880,553	4/1975	Wolford et al. .	
3,938,545	2/1976	Nagy et al. .	
4,178,139	12/1979	Seppanen et al. .	
4,308,000	12/1981	Oakes .	
4,392,790	7/1983	Shibata et al. .	
4,564,041	1/1986	Kramer .	
4,661,047	4/1987	Weis .	
4,679,991	7/1987	Harbison et al. .	
4,726,742	2/1988	Harbison et al. .	
4,886,426	12/1989	Surinak .	
5,145,322	9/1992	Senior, Jr. et al.	417/32

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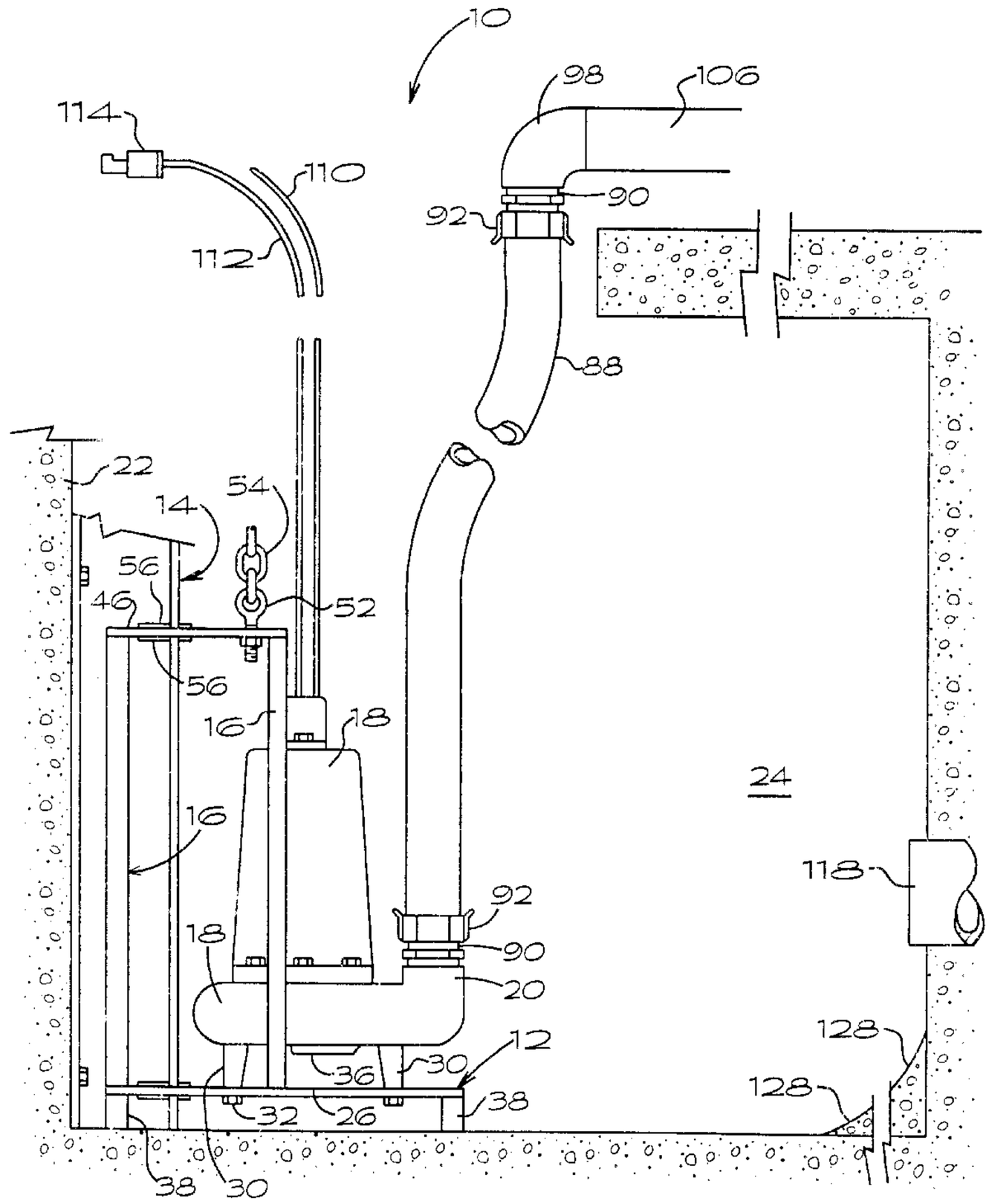
[57] **ABSTRACT**

A universal pump coupling system that allows various style submersible pumps to be mounted to a pump mounting frame assembly to be used interchangeably within a single pump station system. The universal pump coupling system comprises a submersible pump holding device and universal guide rail assembly for use in both submersible and converted dry pit pump stations that allow numerous brands of pumps to be utilized in a single interchangeable system. The universal pump coupling system is particularly suitable for conversion of wet well/dry well pump stations to a single wet well pump station.

19 Claims, 4 Drawing Sheets



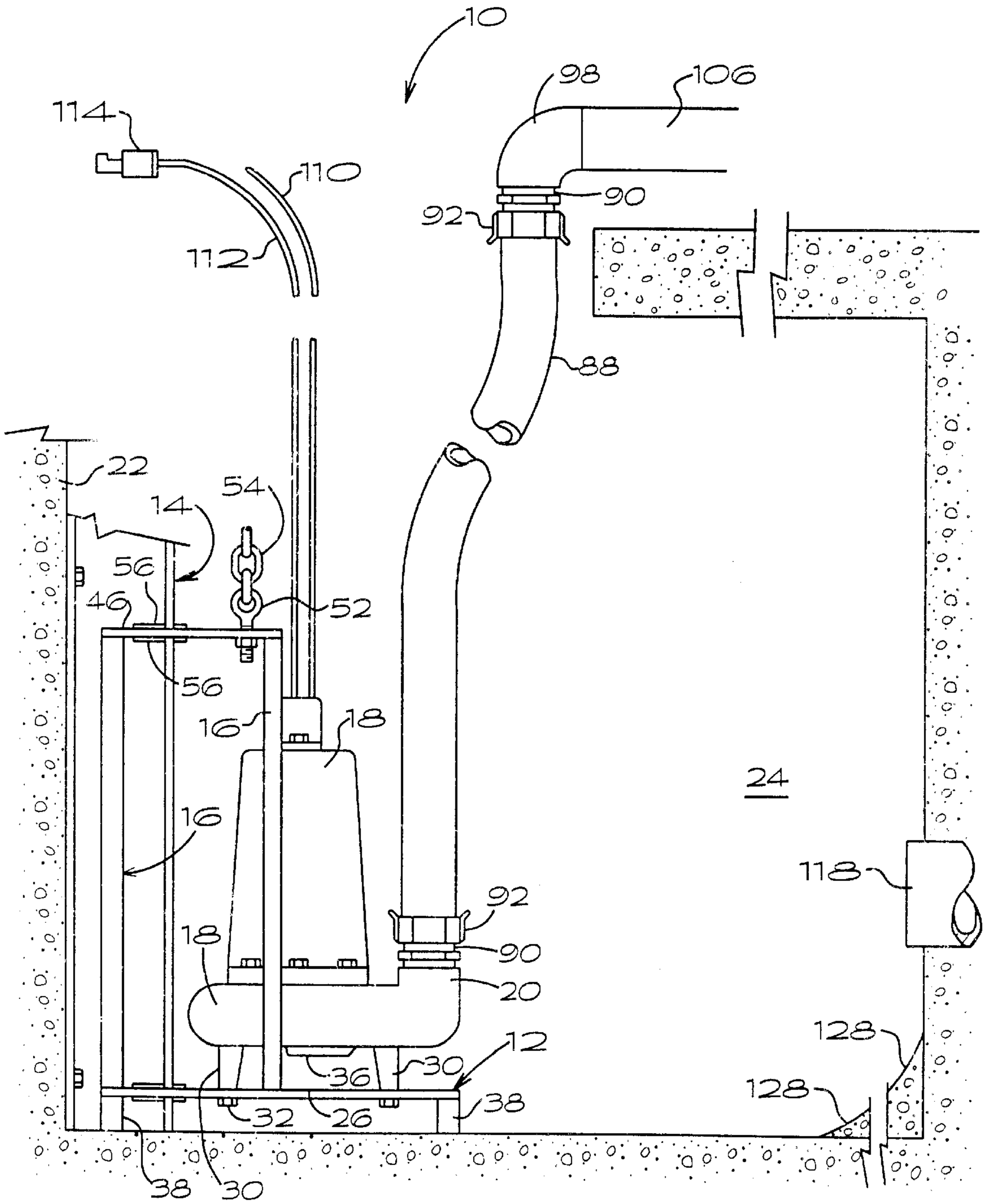

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FIG. 1

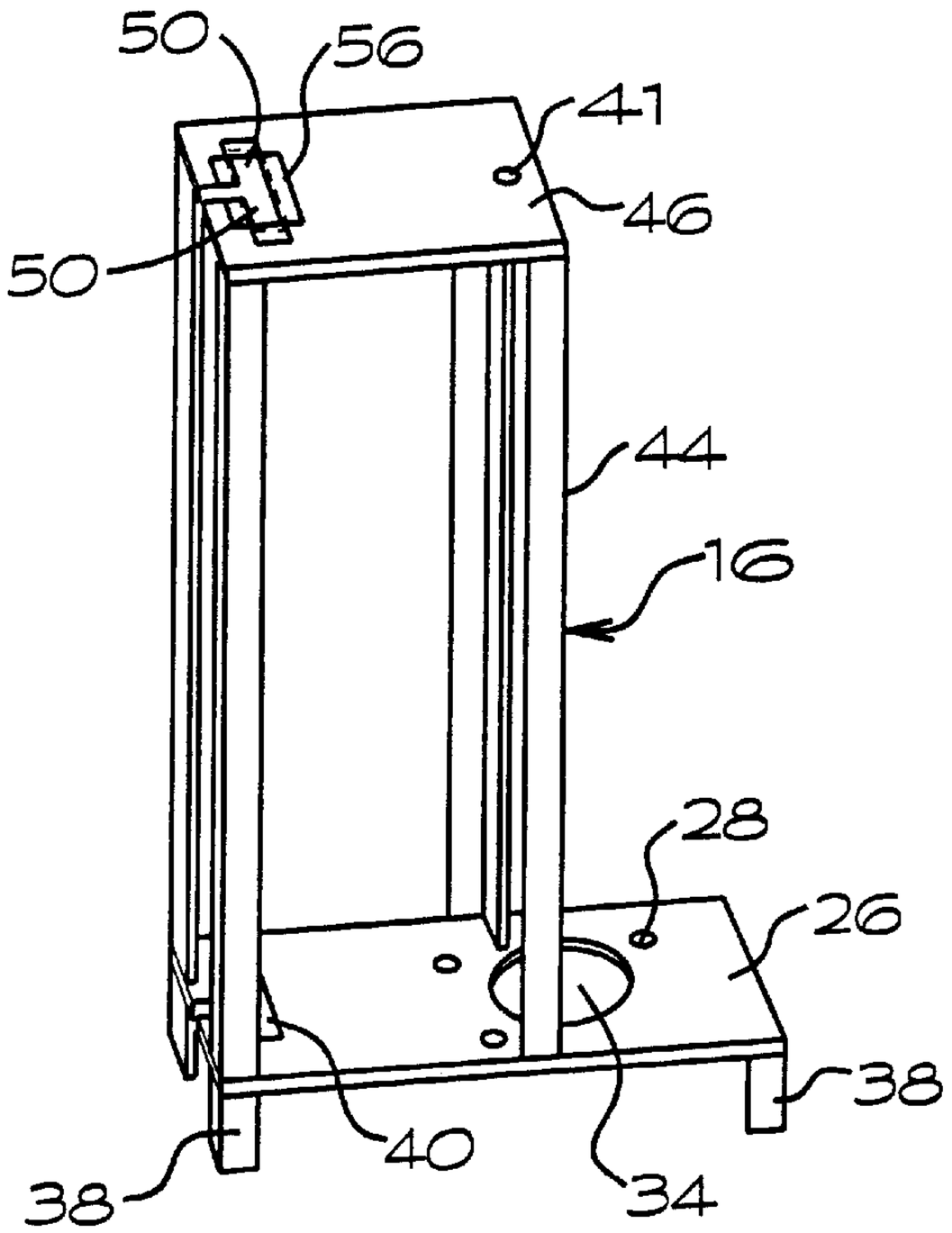

FIG. 2

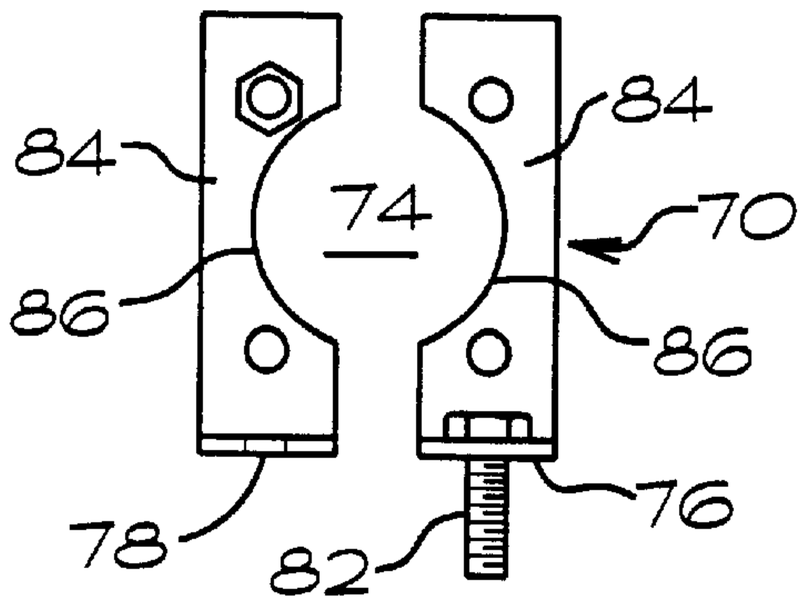

FIG. 3

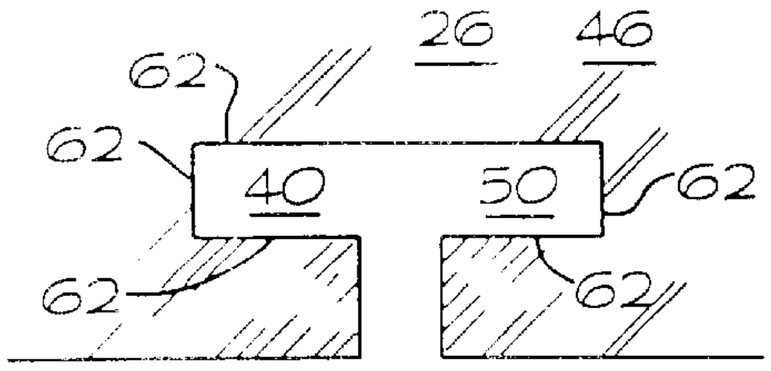

FIG. 5

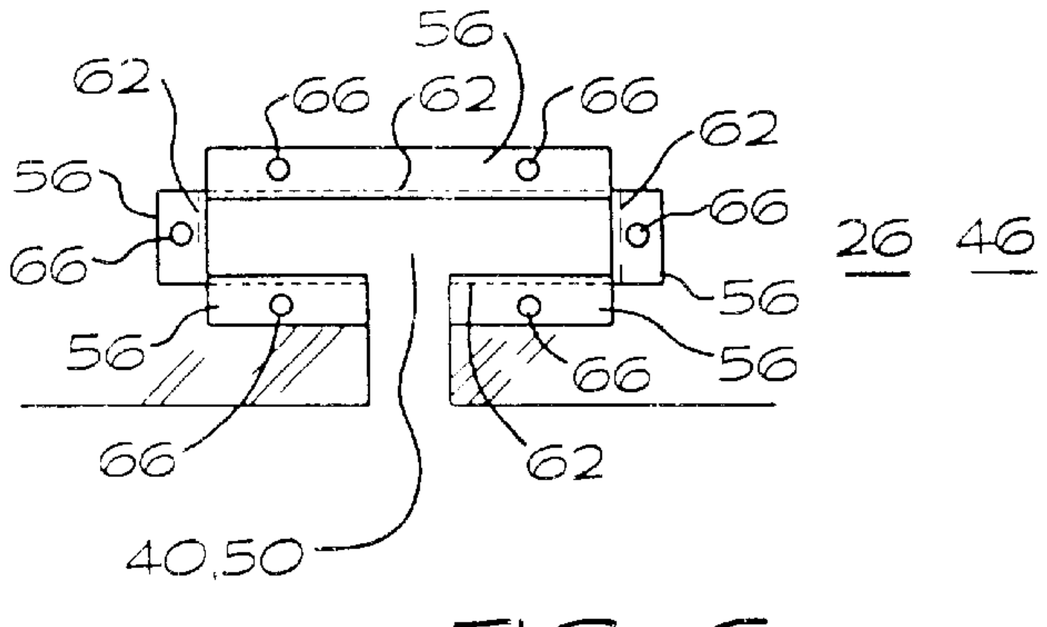

FIG. 6

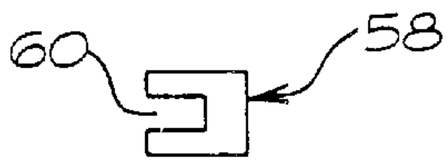

FIG. 8

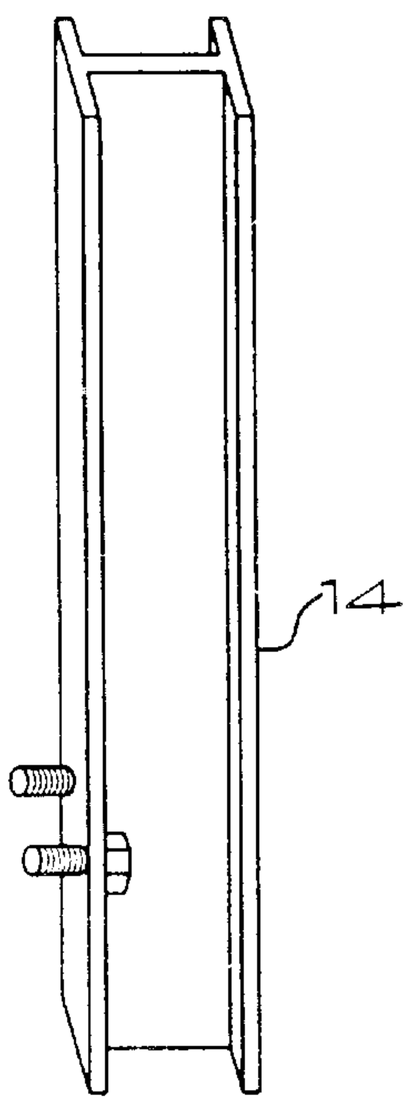

FIG. 7

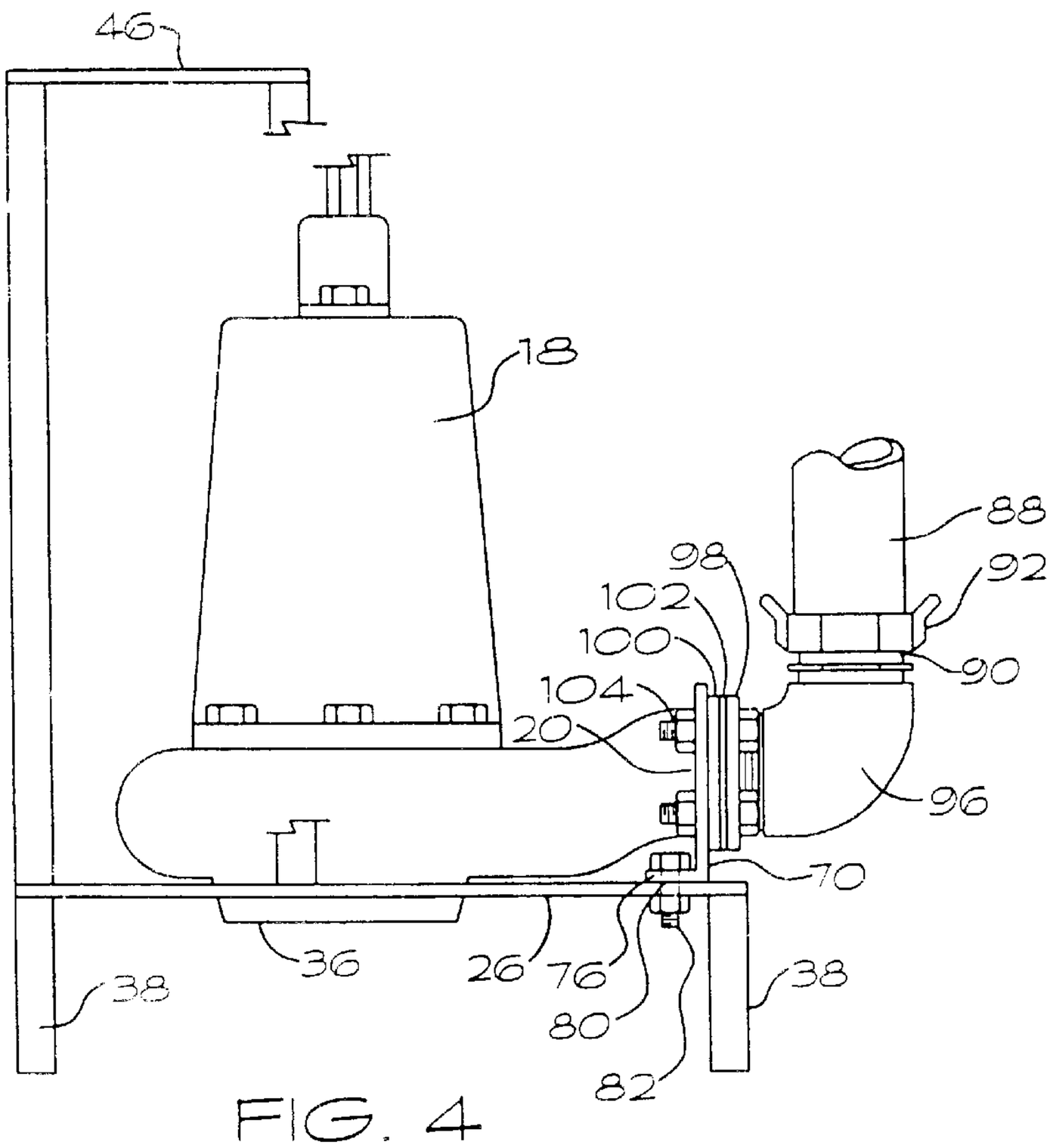

FIG. 4

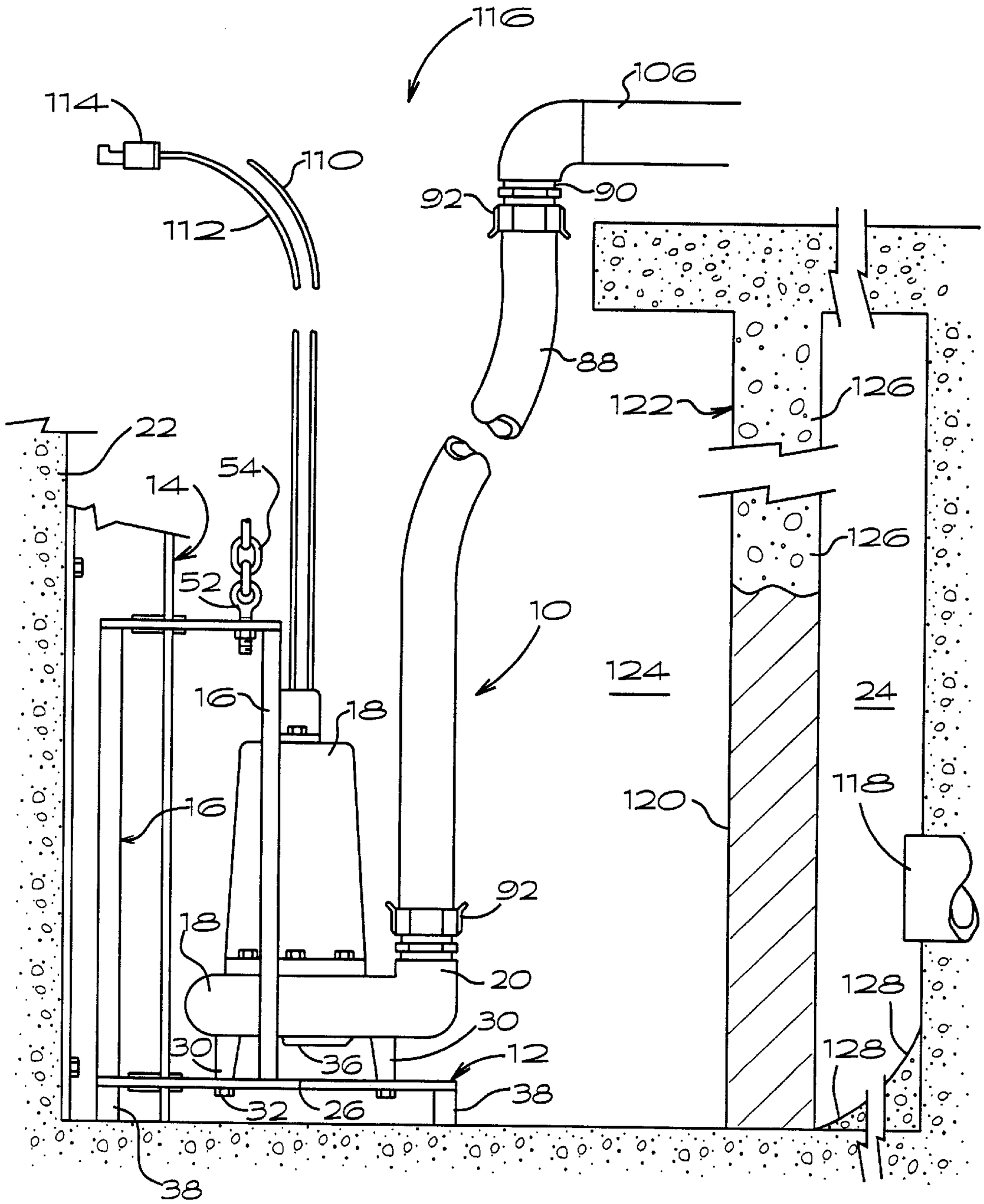
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FIG. 9

UNIVERSAL PUMP COUPLING SYSTEM

This application is a continuation-in-part of Ser. No. 08/207,357, now U.S. Pat. No. 5,529,462 issued on Jun. 25, 1996.

BACKGROUND OF THE INVENTION

Conventional coupling devices are generally designed to provide a method of interlocking a specific type or brand of submersible pump discharge outlet to a specially designed complementary fixed discharge conduit. These coupling assemblies are designed to allow the pump to seal and connect or disconnect to the discharge conduit without binding. The problem with conventional pump coupling devices is that they are specific for each manufacturer's submersible pump. In order to replace or repair pumps from pump stations that are malfunctioning, only pumps that are designed specifically and are manufactured by the same original pump company may be used in that pump station. There are no devices on the market that allows pumps manufactured by various companies to be used in another manufacturer's pump station. This requires that pump system operators replace malfunctioning pumps and rail systems with only the specific replacement parts designed for that individual station. Waste water pump station systems generally have various brands of pump equipment, requiring system operators to stock a large inventory of replacement parts which is time consuming and very expensive.

Another problem that exists with pump mountings is the frequent corrosion that occurs between the face of the pump and the discharge piping. This corrosion caused the face of the pump and the discharge piping to adhere to each other making it difficult to remove the pump from its resting position. In order to remove the pump, personnel must enter the pump station and manually break the bond between the pump and the discharge piping. Also, removal and replacement of malfunctioning submersible pumps in the pump system is time consuming, requiring several personnel and exposing these individuals to possible unsafe conditions due to the possible accumulation of poisonous gases within the pits. Maintenance personnel are also exposed to possible hazards from the wet and slick environment within the sewage pits and from electrical hazards associated with the connection of pump wiring into the stations electrical system. Furthermore, conventional pump systems do not address the removal and replacement of dry pit style pumps with submersible pumps, nor provide a means of conversion of wet well/dry well lift stations into single wet well systems employing interchangeable submersible pump assemblies as does the present invention.

The universal pump coupling system of the present invention provides for a submersible pump coupling device and rail system that allows any brand of submersible pump to be used in any pump station. All wet well piping is removed and replaced with heavy duty suction hose. The hose has one quick disconnect fitting on each end. The discharge piping and all discharge valving is placed above ground for easy access of the user. The entrance to the discharge piping also has a quick disconnect fitting that enables it to be connected to the suction hose. The entrance to the discharge piping is mounted generally at an angle or perpendicular to the rail system with enough clearance to allow the pump mounting device to pass by without touching. Moreover, the electrical and heat sensor cords are fitted with industrial twist type plugs which are coded for each specific plugs in order to facilitate ease of identification. The pump system of the present invention may be utilized in sump or sewage pits and basins and constructed for easy removal from these pits without requiring personnel to enter the confined space of the wet well or pit to maximize safety and downtime.

SUMMARY

The universal pump coupling system including a pump holding device and guide rail assembly for use in both submersible and converted dry pit pump stations overcomes the disadvantages of conventional pump systems and connection devices by providing the system operator with a single interchangeable pump mounting frame and guide rail.

The universal pump coupling system comprises a submersible pump having an inlet and an outlet. A frame assembly supporting the pump is removably mounted thereto. The frame assembly is bolted, welded, or integrally formed and comprises a base plate having a an opening therethrough in flow communication with the pump inlet. The base plate includes a guide means integrally formed therein and has a support means comprising a plurality of legs attached to the bottom for supporting the base plate. The base plate has at least two support members or posts extending upwardly supporting a top plate having a guide means integrally formed therein alignable with the guide means of the base plate. A guide rail defining a vertical longitudinal axis is complementary sized and shaped for slidably engaging the guide means of the top plate and the base plate. The guide rail is secured to a lift station wall by a holding means such as stainless steel brackets and bolts. A flexible discharge conduit is removably secured to the pump outlet using quick disconnect fittings. A means for lifting the frame assembly is removably secured to the top plate for raising and lowering the submersible pump slidably engaging the guide rail for selective coupling and uncoupling of the flexible discharge conduit with the pump outlet.

The pump mounting frame is made from a non-corrosive material such as stainless steel or aluminum; however, material such as fiberglass, graphite or other synthetic polymer material may also be used depending upon the cost and availability. Each pump is fitted with a pump mounting frame that may be modified according to pump specifications to accommodate a specific size or style of the pump dependent upon the height, diameter, discharge point, or any other specific characteristic of the pump. The pump coupling system also differs from all other prior art devices because the mounting frame is designed to hold the pump from the mounting rail and connect to fixed discharge conduit located outside the wet well environment via removable, flexible conduit.

The guide rail assembly and pump holding device of the present invention is constructed of a non-corrosive material so that the environment within these pits do not cause excessive corrosion of the pump system that would create a binding between the elements of the system. Discharge piping within sewage pits of the prior art systems is typically exposed to environmental conditions which cause corrosion and deterioration.

Each pump secured to a pump mounting frame is fitted with a non-corrosive quick disconnect coupling. The quick disconnect coupling is preferably oriented in a vertical upright position. An adaptation device is retro-fitted to the discharge opening of certain types of pumps in order to secure the disconnect coupling in the proper position.

The guide rail for the universal pump coupling system may be constructed from metal; however, a non-corrosive material such as aluminum, stainless steel, noncorrosive

metal alloy, or synthetic material such as fiberglass is preferably used to fabricate the I-beam shaped guide rail of the preferred embodiment; however the shape of the rail may be square, cylindrical, flat, or any other desirable shape.

The guide rail system provides a means to raise and lower the pump and pump mounting frame from a set position in the wet well and secure the pump mounting frame and pump against rotation.

Conventional pump coupling devices are designed to fit securely to a fixed conduit. The universal pump coupling system does ordinarily use a fixed conduit within the wet well. Other than elbows or short sections of conduit, all of the fixed conduit within the pump station is outside of the wet well where environmental conditions are not as conducive to corrosion. Preferably, all of the conduit within the well is flexible. The discharge conduit used in the universal pump coupling system within the wet well is a flexible, high quality hose. This discharge hose is fitted with quick disconnect couplings at each end. The discharge hose transports the pumped material outside of the wet well to the fixed discharge conduit. The use of hose within the wet well versus use of fixed discharge conduit assures the operator that the pump will not bind with the discharge conduit.

All fixed discharge piping and valving are located outside of the wet well environmental conditions. The inlet portion of the fixed discharge piping is fitted with a quick disconnect coupling in a downward vertical position located above the pump mounting frame. This disconnect coupling and piping is offset slightly to allow the pump mounting frame and pump to pass when raising or lowering. The positioning of the pump discharge quick disconnect and the inlet fixed conduit quick disconnect maintains the discharge hose in a vertical position free of stress when the pump is in operation.

The end of each submersible pump cord is fitted with the male portion of a twist lock plug-in. Each pump station electrical panel is fitted with a corresponding female twist lock plug-in receptacles which may be tagged or color coded for ease of identification. The use of twist lock (or comparable) plug-ins allows for quick and safe connection and disconnection to the electrical system. Both the pump station electrical system and the individual pumps are checked for proper coordinated wiring. This assures the system operator that the pump rotation will be correct each time a pump is placed into operation.

The universal pump coupling system of the present invention is also used to convert wet well/dry well style pump stations to single wet well submersible stations. This conversion is achieved by removing approximately two-thirds of the bottom portion of the wall that separates the wet well from the dry well creating a single wet well unit. In most cases, this single wet well unit can nearly double the holding capacity of the pump station. The elimination of dry wells in pump stations and the subsequent replacement with the universal pump coupling system is advantageous to the system operator because down time is reduced, less maintenance is required, there is easy access to discharge pipes and valves above the station, and confined space entry is eliminated.

The universal pump coupling system allows standardization within pump station systems eliminating the need to purchase new or identical pumps. All submersible pumps within the system can be standardized through the use of the pump mounting frame and universal guide rail assembly. Malfunctioning pumps can be removed and replaced quickly because the pump discharge will not bind on discharge conduit as with known prior art devices. Electrical connection is also achieved quickly with the use of twist lock plug-ins. Each feature of the universal pump coupling system is designed to provide the operator with a quick, safe, and cost effective means to service malfunctioning pumps.

It is an object of the present invention to provide a pump mounting frame having a secure mounting for the pump having a holding device that is fitted to a guide rail system, wherein the holding device used in combination with the guide rail system stabilizes the pump against rotation.

It is another object of the present invention to provide a universal pump coupling system creating better operating conditions and providing system operators with quick, easy, and safe removal and replacement of submersible pumps when a malfunctions occur.

It is another object of the present invention to select a guide rail means using a noncorrosive material.

It is another object of the present invention to select a material that operates in conjunction with the pump mounting frame in a smooth, non-binding motion.

It is another object of the present invention to provide a a single type of guide rail within the pump station system so that all pump mounting frame's are interchangeable.

It is another object of the present invention to provide a a single type of guide rail within the pump station system that will hold the pump mounting frame securely in place.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the present invention will be had upon reference to the following description in conjunction with the accompanying drawings in which like numerals refer to like parts throughout the several views and wherein:

FIG. **1** is a partly broken, cutaway side view of the universal pump coupling system of the present invention showing a pump supported by a mounting frame in a wet well pump station.

FIG. **2** is a perspective view showing the pump mounting frame of the present invention.

FIG. **3** is an elevational plan view showing a pump mounting bracket for securing a pump to a pump mounting frame.

FIG. **4** is a side elevational view showing a submersible pumps secured directly to the pump mounting frame of FIG. **5**.

FIG. **5** is a top plan view of a slot formed within base plate of the pump mounting frame of the present invention.

FIG. **6** is a top plan view of the slot of FIG. **2**, including a friction reducing material lining the slot of the pump mounting frame engaging the guide rail.

FIG. **7** is an elevated perspective view showing I-beam guide rail of the present invention having anchor bolts extending therefrom.

FIG. **8** is an elevated side view showing a strip of the friction reducing material which lines the slots of the pump mounting frame.

FIG. **9** is a partly broken, cutaway side view of the universal pump coupling system of the present invention utilized in the conversion of a wet well/dry well pump station to a single wet well pump station.

FIG. **10** is a plan view showing a flange disconnect quick coupling assembly.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawings, FIG. **1** illustrates the universal pump coupling system **10** having a submersible

pump including a pump inlet and pump outlet, a pump mounting device **12** and a guide rail assembly **14** positioned within a wet well sewage lift station.

A major component of the pump mounting device **12** is the pump mounting frame **16** shown in FIG. **2**, which enables different types of pumps to be used interchangeably within a single pump station. The pump mounting frame **16** provides a means to hold in place any manufacturers pump and motor assembly **18** with its discharge outlet **20** directed outwardly away from the inside wall **22** of the pump station wet well **24**. In the preferred embodiment, the pump discharge outlet **20** is positioned at an angle of from about 45 degrees to about 135 degrees, and more preferably at a 90 degree angle with respect to the wet well wall **22**. The mounting frame **16** is modified dimensionally to provide proper positioning for pumps having different structural features as shown in FIG. **4**. The mounting frame **16** is designed to hold the pump **18** in a generally vertical position and provide a stable framework that keeps the pump **18** from rotating on its axis while in operation. The pump mounting frame **16** and submersible pump **18** once properly attached together forms a single unit providing a universal pump mounting device **12** for raising and lower the pump **18** into its proper operating position within the pump station wet well **24**.

The universal pump coupling system **10** requires the use of a single rail **14** within a pump station system. It is advantageous to the system operator to require this single rail **14** to facilitate pump interchangeability using the pump mounting frame **16**. Of course it is contemplated that additional rails may be utilized to provide greater stability, although one rail is usually sufficient. As illustrated in the preferred embodiment, a rail member, preferably an "I-beam shaped" rail **14** is secured to the inside wall **22** of the wet well **24** by holding means such as stainless steel bolts, such as is shown in FIGS. **1** and **7**. It is contemplated that a "T-shaped" beam, two "C-channel" beams, a single pipe or cylindrical member, or any number of other rail configurations may also be utilized to cooperatively engage in at least one guide means and preferably in an upper and lower guide means. For instance, the lower guide means may define a guide slot formed within the pump mounting frame **16** as long as the guide means is of a corresponding shape for cooperatively engaging the rail member **14**. In the preferred embodiment, the "I-shaped" configuration provides an inexpensive, readily available, strong support which is easily fastened to the wall or anchored within the concrete floor of the dry **24**. The rail **14** may be composed of metal such as steel, but is preferably composed of noncorrosive material such as stainless steel or aluminum galvanized steel, and even more preferably the rail **14** is composed of fiberglass.

The mounting frame **16** shown in FIGS. **1** and **2** include several features to properly secure the heavy submersible pump **18** in position in sliding engagement with the rail **14**. The mounting frame **16** may be of an integral one piece configuration formed by molding or casting, or as shown in the preferred embodiment the guide frame may be welded or bolted together. The mounting frame **16** includes a base plate **26**. In the preferred embodiment, the base plate **26** includes a plurality of holes **28** spaced apart in a manner to properly align and secure a plurality of pump legs **30** to the frame **16** by securing means such as bolts **32** preferably composed of stainless steel. However, it is contemplated that the pump may be supported by alternate support means such as runners which may be bolted to the base plate **26**. The base plate **26** in the preferred embodiment includes a generally central opening **34** in fluid communication with the pump suction inlet opening **36** for permitting fluid connection with liquid to be sucked from below the frame **16** into a submersible pump **18** mounted directly onto the base plate **26** as shown in FIG. **4**. Some pumps may suck material from the side or have a conduit extending outwardly and downwardly from the base plate **26**, and the base plate **26** may be adapted to accommodate such an arrangement. Some types of pumps **18** may also be supported by legs **30** or other support means mounted to the base plate **26** such as is shown in FIG. **1**. The submersible pump's **18** suction inlet **36** opening size determines the diameter of the pump inlet opening **34**. The base plate **26** is also fitted with support means comprising mounting frame legs **38**. It is contemplated that runners may be substituted for the frame legs. The length of the mounting frame legs **38** determine the distance the pump inlet **36** sets from the bottom of the pump station wet well **24**. The frame legs **38** or other support means are designed to be a specific height based on the desired distance of the pump inlet opening **36** to the lift station floor. The mounting frame leg **38** height can be altered in order to provide optimum operating conditions and suction for various pump **18** designs. Mounting the pump **18** above the wet well floor rather than directly to the floor provides optimal fluid flow and prevents accumulation and clogging of the pump **18** inlet with sludge solids.

In the preferred embodiment, the base plate **26** includes a lower guide means formed therein consisting of a corresponding slot sized and shaped for cooperative engagement therewith. In the preferred embodiment, the slot means comprises a base slot **40**, more particularly, a "T-shaped" slot, on the side of the mounting frame **26** positioned toward the wall **22** as shown in FIGS. (**2**, and **4–6**). The base slot **40** is in cooperative slidable engagement with the guide rail **14**, more particularly, an "I-beam shaped" guide rail **14**, secured to the inside wall **22** of the wet well **24**, such as shown in FIGS. **1** and **7**. It is contemplated that an upper guide means **40** may provide additional stability and support in cooperative sliding engagement with the guide rail **14** may be configured in various other complementary sizes and shapes. The slot **40** formed in the bottom plate **26** of the pump mounting frame **16** provides stability for raising and lowering the pump **18** in the wet well **24**. The shape of the slot **40** provides a means for adapting the mounting frame **16** so that any submersible pump **18** mounting on the frame **16** is interchangeable with any universal pump coupling system **10** at other pump stations within the water and waste treatment system.

As shown in FIG. **2**, a plurality of support members, preferably, four support members **44** form longitudinal members or legs in the shape of angle iron and constructed from noncorrosive material such as stainless steel, extend upwardly from the base plate **26** in cooperative engagement with a top support plate **46**. The top plate **46** is generally sized to be smaller than the base plate **26** to provide for easy installation and unrestricted access to the pump **18**, and further to allow the pump electric/control cords to extend upwardly from the pump **18** toward the surface without interference from the top plate **46**. The top plate **46** is also fitted with a guide means consisting of a correspondingly shaped "T-shaped" top slot **50** on the side of the mounting frame **26** positioned toward the wall **22** and in alignment with the base slot **40** for cooperative slidable engagement with the "I-beam shaped" rail **14** secured to the inside wall **22** of the wet **24**. The top slot **50** and base slot **40** provide overall stability to the universal pump coupling system **10** when stationary as well as for raising and lowering the pump mounting device **12**. In the preferred embodiment, the top

plate **40** includes a hole **41** that is connected to a lifting means consisting of a stainless steel eye-bolt **52** that is connected to a lift chain **54** for permitting removal of the pump mounting device **12** from the wet well **24** as illustrated in FIG. **1**. The hole **41** for the eye-bolt **52** is positioned according to the center of gravity of the pump **18** and mounting frame **26** in order to balance the total weight. This is imperative in order to lift the pump **18** and mounting frame **18** assembly in a smooth ascension from the wet well **24**. The frame **26** and submersible pump **18** slidably engage the guide rail **14** for raising and lowering the universal pump coupling system **10** and for coupling and uncoupling the pump outlet **20** with a flexible discharge conduit the extends outside of the wet well **24**. It is understood that a plurality of frame members could be substituted for the top plate **46** and support the guide means and lifting means.

Although not essential, the use of a friction reducing material **56** is an important feature of the present invention to prevent binding and promote smooth sliding operation of the pump mounting frame **16** in cooperative sliding engagement with the rail **14**. As shown in FIG. **6**, the base slot **40** and top slot **50** in the preferred embodiment are lined with ultra high molecular weight friction reducing material **56** such as: polyethylene, ("UHMW"), teflon, graphite fiber, or some other non-corrosive, nonabrasive smooth material, such as a synthetic polymer in order to provide a non-binding surface between the slots **40**, **50** and the rail **14**. As shown in FIGS. **2** and **6**, the friction reducing material **56** be in the form of a flexible strip folded around the edges **62** of the plate **26**, **46** and fastened thereto; or preferably a block **58** of friction reducing material **56** having a groove **60** therein, which may be attached to the slot **40**, **50** in a tongue and groove arrangement wherein the edge **62** of the slot **40**, **50** forms a tongue in cooperative engagement with the groove **60** so that the friction reducing material **56** lines the slot **40**, **50**. The strips or blocks **58** may include a plurality of holes **64** therethrough alignable with holes **66** formed within the plates **26**, **46** for cooperative engagement with screws or bolts **68** for removably securing the friction reducing material **56**. FIG. **6** shows the positioning of the friction reducing material **56** covering the edge **62** of the guide means **40**, **50** shown in phantom lines.

A pump mounting means such as one piece mounting bracket **70**, connected by is utilized in combination with the mounting frame **16** for pumps **18** designed without legs **30**, such as shown in FIG. **4**. As shown in FIG. **3**, the pump mounting bracket **70** of the preferred embodiment consists of a split main body comprising panels **84** having a pump discharge outlet hole **74** formed therein. The panels **84** may be attached to the frame **16** separately or removably secured to one another by holding means. The bracket **70** is bent at the bottom forming an attachment flange **76** having mounting holes **78** therein for attachment to the base plate **26** and alignable with mounting holes **80** formed therethrough with fastening means such as stainless steel bolts **82**. The two sections of panels **84** each have a portion of a semi-circular aperture **86** formed between them adapted to surround the pump discharge outlet **20**. The attachment flange **76** is simply removably secured to the base plate **26**, and the single bracket **70** or the half brackets **84**, are aligned with and removably secured to the pump outlet flange **20**. Additional fastening means such as one or more non-corrosive U-bolts, preferably composed of stainless steel may be used to securely fasten the pump **18** to the base plate **26**.

As shown in FIG. **1**, the pump **18** is mounted to the pump mounting frame **16** so that the discharge outlet **20** extending upwardly in a vertical direction. Some pumps **18** require a pump discharge outlet adaptor **96**. The adaptor **96** may be formed in a variety of shapes to fit specific pumps as long as the adapter provides a means for allowing the outlet to be generally perpendicular to the lift station floor in an upright position. The adaptor **96** shown in FIG. **4** is an elbow shaped adapter **96** which permits the flow of liquid from the discharge outlet **20** to extend outwardly and upwardly in a vertical direction, as is illustrated in FIG. **4**. Such an adapter **96** is commercially available and usually has a flange **98** on the pump **18** connection end having holes alignable with holes provided in the flange **100** of the pump discharge outlet **20**. Usually a gasket **102** is placed between the pump flange **100** and adapter flange **98** which are secured together by holding means such as stainless steel bolts **104**.

Each submersible pump **18** and discharge hose **88** is fitted with a cam-lock quick disconnect assembly **89** including a male cam-lock quick disconnect coupling **90** and female cam-lock quick disconnect coupling **92** composed of a non-corrosive material such as a plastic (i.e. nylon, PVC, or polyethylene), aluminum, brass, or stainless steel. The pump **18** in FIG. **4**, and the adapter **96** in FIG. **1** are fitted and threadably engaged, with a male cam-lock quick disconnect coupling **90** defining a cylindrical end having a reduced circumference near the end forming a groove therearound. The discharge hose **88** is fitted with a cooperatively engaging female cam-lock quick disconnect coupling **92** defining a cylindrical end having a corresponding larger diameter than the male end in order to receive the male end **90** therein, so that biasing means such as cam shaped levers may be depressed to extend in to the reduced diameter groove extending around the male end **90** to bias the male end within the female end **92**. The opposite end of the discharge hose **88** is also fitted with a female cam-lock quick disconnect coupling **92**; however, an interlocking male cam-lock quick disconnect coupling **90** could be used to cooperatively engage a fixed discharge conduit **106** located outside of the wet well.

A unique feature of the universal pump coupling system **10** is the use of the flexible discharge hose **88** which serves as a permanent discharge conduit within the wet well **24** of each pump station as opposed to conventional rigid pipe installations. The flexible discharge hose **88** in the preferred embodiment is made of a thick walled high strength ribbed suction hose **87**. Such a hose is usually composed of polymer fibers and rubber. Hoses may also be obtained utilizing steel reinforcement in the form of wire. The hose may define a smooth outer surface or have corrugations therein. The length of the flexible hose **88** should have some slack and be slightly longer (approximately 2–3 inches) than the distance between the male cam-lock quick disconnect **90** of the submersible pump **18** in its lowered fixed position in the wet well **24**, and the male cam-lock quick disconnect **90** of the fixed discharge conduit **106** located above the wet well **24**. The extra length provides the system operator enough slack within the flexible conduit **20** to connect or disconnect the cam-lock couplings **90**, **92** when installing or replacing a submersible pump **18**.

All fixed discharge piping in the universal pump coupling system **10** is located outside of the wet well **24** environment. In the preferred embodiment, a male cam-lock quick disconnect coupling **90** is secured to the fixed discharge piping **106** with a 90 degree elbow adapter **98** as illustrated in FIG. **1**. The adapter **98** is connected to the fixed discharge horizontal piping **106** and valving, located above the wet well **24**. The piping and valving includes a horizontal section of fixed discharge pipe **106**, a flanged check valve **99**, a flanged gate valve **129** or any other flow through valve that

can closed during repair, a flanged 90 degree elbow adapter **98**, and a flanged "T" or "cross" connected to the receiving force main. It is recommended that each pump station have a minimum of two submersible pumps **18** connected to fixed discharge piping **106**.

The end of each submersible pump cord is fitted with the male portion of a twist lock plug-in. Each pump station electrical panel is fitted with a corresponding female twist lock plug-in receptacles which may be tagged or color coded for ease of identification. The use of twist lock (or comparable) plug-ins allows for quick and safe connection and disconnection to the electrical system. Both the pump station electrical system and the individual pumps are checked for proper coordinated wiring. This assures the system operator that the pump rotation will be correct each time a pump is placed into operation.

Unlike conventional 3-phase electrical hard wiring 240/480 volt connections for waste water pumps, the universal pump coupling system **10** electrical system is designed so that individuals with very little electrical training could safely and easily connect each submersible pump **18** to a power source. The submersible pumps **18** have two cords providing electrical power and sensor means in electrical communication with the submersible pump electrically connected with a electrical panel **108** with twist lock plugs placed above the wet well **24** environment. These cords include the electrical cord **110** connected to a power source for running the pump **18**, and a heat sensor cord **112** connecting a thermocouple within the pump power source or motor **111** to an indicator source to which may be connected a "chatterbox" **130** for communicating a message to a control center indicating the pump **18** requires maintenance due to heat buildup in the pump bearings or motor. Each cord **110**, **112** is fitted with the male portion of a twist-lock plug-in **114**. The electrical panel power source and heat sensor source are fitted with the corresponding female plug receptacle **115** portion of a twist-lock plug-in **114**, or comparable high quality corrosion resistant plug-in. Pump rotation, which is dependent upon wiring within each plug **114** portion, is checked and set in each pump station and each replacement pump **18** within the system. The female power receptacle wiring is preset based on pump rotation. Therefore, when pump **18** replacement is required, system personnel are able to place the replacement pump **18** into service with the assurance that all wiring is proper.

When converting an existing dry well **124** pump stations to a well pump station **24**, the universal pump coupling system **10** operator is not restricted to converting only the pump stations that are already designed for submersible pumps **18**. The universal pump coupling system **10**, is particularly suitable for conversion of an dry well **124**/wet well **24** systems shown in FIG. **9** into single wet well **24** system as shown in FIG. **1**. Due to the safety hazards associated with dry wells **124** which require maintenance personnel to climb into a dry well pit, (often containing poisonous gases), these dry wells **124** may be converted into wet wells **24** using the aforementioned universal pump coupling system **10**.

FIG. **9** shows a cross section of a wet well/dry well pump station **116** that has been converted using the universal pump coupling system **10**. Conversion of wet well/dry well pump stations **116** to single well systems **24** is requires several steps. The changeover can only be achieved after the universal pump coupling system **10** are installed according to the aforementioned specifications including the fixed discharged conduit piping **106**, valving, and electrical panel system **108** are ready to be placed into service. Sewage is then restricted from entering the station **116**, by using an existing valve or by plugging the sewage pipe inlet **118** or by diverting the sewage upstream from the station **116**. All of the remaining sewage is removed from the wet well **24**, such as with a portable pump. Approximately, the bottom two-thirds **120** of the dividing wall **122** is knocked out between the wet well **24** and dry well **124** leaving the remaining one-third **126** of the dividing wall **122** in place. It is advantageous to leave the remaining dividing wall **126** in an arch shape (or triangular shape) with the highest point (narrowest wall height) being located in the center of the dividing wall **122**. Leaving a portion of the arched dividing wall **126** forms a narrow passage or restriction between the dry well **124** and wet well **24**. Water flowing into the dry well portion **124** from the wet well **24** portion creates a type of venturi effect increasing the velocity of the flow of liquid through the arch restriction whereby the velocity decreases as the liquid flows into the larger dry well **124**, creating turbulence and eddies which facilitates mixing of the sewage. Although not absolutely necessary, it is desirable to clean the floor of the wet well **24** and pour concrete providing a sloped floor **128** sloped toward the pump **18**. The sloped concrete floor **128** may be extended into the dry well **124** area near the pump **18** to provide the optimum protection against sludge build-up such as is shown in FIG. **9**.

The foregoing detailed description is given primarily for clearness of understanding and no unnecessary limitations are to be understood therefrom, for modifications will become obvious to those skilled in the art based upon more recent disclosures and may be made without departing from the spirit of the invention and scope of the appended claims.

I claim:

1. A universal pump coupling system, comprising:

a submersible pump having an inlet and a discharge outlet;

a base plate supporting said pump removably mounted thereto, said base plate having an opening therethrough in flow communication with said pump inlet, said base plate including a lower guide means;

a frame extending upwardly from said base plate including an upper guide means positioned to be alignable with said lower guide means of said base plate;

a guide rail defining a vertical longitudinal axis, said guide rail being complementary sized and shaped for slidably engaging said upper guide means and said lower guide means of said base plate, said guide rail being secured to a lift station wall by holding means; and

a flexible discharge conduit attachable to said pump outlet.

2. The universal pump coupling system of claim **1**, including means for lifting said frame assembly removably secured to said frame for raising and lowering said frame.

3. The universal pump coupling system of claim **1**, wherein said base plate is designed to hold said submersible pump in a fixed position with its discharge outlet angled outwardly from the lift station wall at a range of about 45 degrees to about 135 degrees.

4. The universal pump coupling system of claim **1**, wherein said upper guide means is integrally formed within a top plate attached to said frame.

5. The universal pump coupling system of claim **1**, wherein said upper guide means and said lower guide means comprises a "T-shaped" slot.

6. The universal pump coupling system of claim **1**, wherein said upper guide means and said lower guide means

is lined with a friction reducing material to provide a nonbinding surface between said guide means and said guide rail.

7. The universal pump coupling system of claim **6**, wherein said friction reducing material is a polymer selected from the group consisting of polyethylene, ultra molecular high weight polyethylene, teflon, or graphite material.

8. The universal pump coupling system of claim **1**, including means for sensing the heat generated by said submersible pump or the pump motor.

9. The universal pump coupling system of claim **1**, including a means for removably securing said lift means to said frame.

10. The universal pump coupling system of claim **1**, wherein said guide rail is comprised of a noncorrosive material selected from the group consisting of aluminum, fiberglass, galvanized steel, or stainless steel.

11. The universal pump coupling system of claim **1**, wherein said guide rail is formed having a cross-sectional shape corresponding to the cross-sectional shape of said lower guide means and said upper guide means.

12. The universal pump coupling system of claim **1**, including an adapter for connecting said submersible pump outlet to a flexible discharge conduit, said adapter providing a means of orienting said pump outlet in a selected position.

13. The universal pump coupling system of claim **1**, wherein said adapter forms an elbow.

14. The universal pump coupling system of claim **1**, said pump outlet and said flexible discharge conduit being connected together by a cam-lock quick disconnect assembly.

15. The universal pump coupling system of claim **1**, including means for supplying electric current to said submersible pump and an electric power cord having a male portion of a twist lock plug-in for providing electrical communication with a female twist lock plug-in receptacle of a lift station electrical panel, wherein said female twist lock plug-in receptacle wiring is preset based on pump rotation.

16. The universal pump coupling system of claim **8**, wherein means for sensing heat in said submersible pump motor is a thermocouple electrically connected to an electric power cord having a male portion of a twist lock plug-in which for providing electrical communication with a female twist lock plug-in receptacle of a lift station electrical panel, and the female power receptacle wiring is preset based on pump rotation, wherein said lift station electrical panel is in communication with means for communicating a message to a control center.

17. The universal pump coupling system of claim **1**, wherein said upper guide means supported by said support member is formed within a top plate.

18. The universal pump coupling system of claim **17**, wherein said base plate is supported by a plurality of support members.

19. A method of converting a wet well/dry well pump station to a single wet well pump station, including the steps of:

removing approximately the bottom two-thirds of a dividing wall that separates the wet well and the dry well;

leaving the remaining one-third of the dividing wall in an arch shape having the highest point located in the center of the dividing wall;

adding concrete to the floor of the pump station sloping the outer edges toward the center of the station and toward the pump inlet;

removing the existing pump and conduit assembly;

inserting a universal pump coupling system, comprising a submersible pump having an inlet and a discharge outlet, a base plate supporting said pump removably mounted thereto, said base plate having an opening therethrough in flow communication with said pump inlet, said base plate including a lower guide means, a frame extending upwardly from said base plate including an upper guide means positioned to be alignable with said lower guide means of said base plate, a guide rail defining a vertical longitudinal axis, said guide rail being complementary sized and shaped for slidably engaging said upper guide means and said lower guide means of said base plate, said guide rail being secured to a lift station wall by holding means, and a flexible discharge conduit attachable to said pump outlet.

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